# FESHM 2110: Establishing Code Equivalency with International Codes and Standards

**Revision History**

| Author | Description of Change | Revision Date |
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| Martha Michels | Initial release of chapter | June 1, 2016 |

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# 1.0 INTRODUCTION

This FESHM chapter describes the method used to establish code equivalency between U.S. and International engineering design codes and standards. This will enable the Laboratory to accept in kind contributions from International partners or purchase equipment designed per International standards while assuring an equivalent or greater level of safety. This may be applicable to activities at Fermilab and at remote sites as well (e.g. Sanford Underground Research Facility)

# 2.0 DEFINITIONS

## 2.1 Appropriate U.S. Governing Code

A national, state or local engineering code or standard that specifies design, fabrication, and operation requirements and practices that must be followed for systems within their respective scopes.

## 2.2 An International Code or Standard

A recognized international (non-U.S.) code or standard, for example European harmonized standards of European Pressure Equipment Directive (97/23/EC) or Low Voltage Directive (2006/95/EC).

## 2.3 Code Equivalency Review

Review of code equivalency between international and U.S. codes or standards for a specific type of equipment, for example mechanical, pressure or electrical equipment. The goal of review is to provide evidence, or lack of such, that the safety of equipment designed, fabricated, installed and operated per an international standard is equal or greater than the safety of same equipment if designed, fabricated, installed and operated per appropriate U.S. governing code or standard. See Figure 1 for details of the process.

## 2.4 White Paper

A written analysis supporting code equivalency of the international code or standard to the appropriate U.S. code or standard already accepted by Fermilab. The analysis must provide evidence that the safety of equipment designed, fabricated, installed and operated per an international standard is equal or greater than the safety of same equipment if designed, fabricated, installed and operated per appropriate U.S. governing code or standard. See Figure 1 for details of the process.

## 2.5 Qualified Person

A qualified person is a person who, by possession of a recognized degree or certificate of professional standing and by extensive knowledge, training and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work, and therefore can be considered a Subject Matter Expert (SME). A group of qualified people of the right level of expertise is typically needed to establish code equivalency between international

and U.S. codes and standards. It may be necessary to engage qualified persons from outside the laboratory for some code equivalency reviews.

## 3.0 RESPONSIBILITIES

### 3.1 Chief Safety Officer (CSO)

The Chief Safety Officer is responsible for the development of this policy and oversight of its implementation, including seeking approval of code equivalency between international and U.S. codes and standards from DOE Site Office manager.

### 3.2 D/S/P Head

The D/S/P Head (or designees) is responsible for the implementation of this chapter's requirements in their organization or on their Project by allocating resources for investigative work of internal and external qualified persons necessary to establish code equivalency between international and U.S. codes and standards.

### 3.3 Division Safety Officer/Project Safety Officer

The DSO assists the D/S/P Head in ensuring the requirements of this chapter are implemented in their organization.

### 3.4 FESHCom Subcommittee Chairs

The chairperson for each relevant FESHCom shall ensure that the right level of expertise is involved in the code equivalency review. The Chair is also responsible for selecting the qualified persons who will write the documentation that will serve as the justification for accepting an code equivalency.

### 3.5 DOE Fermi Site Office (FSO)

DOE Fermi Site Office (FSO) is responsible for review of recommendations submitted by CSO and making a decision on approval in a timely fashion.

## 4.0 PROGRAM DESCRIPTION

Fermilab requires global engineering design for neutrino detectors, linear accelerators, and other scientific installations. In many instances, such projects are international and involve collaboration and partnership with many scientific institutions and universities from all over the world. These institutions may contribute equipment for installation at Fermilab or at Fermilab experiments. Additionally, in effort to obtain superior and safe technology at lower costs, Fermilab may bid to procure equipment from international companies. When such equipment is built, it is typically built per one of the international Standards or Directives. For example, equipment built to European standards is CE-marked to declare its conformity to such standards.

Procedures for design and acceptance of mechanical and electrical equipment utilizing ASME, ANSI, OSHA and other applicable U.S. standards are well established and incorporated into other parts of this manual. However, experience with procurement from Europe shows that the benefits of using an alternative to U.S. Standards (e.g. EN Standards) are not being fully utilized, which results in excessive costs, duplicated effort and ineffective use of resources for integrating mechanical and electrical equipment designed and built by non-U.S. laboratories and international manufacturers.

The code equivalency process is the formal engineering analysis that captures the comparisons of the U.S. Codes and Standards vs. a particular international standard and the conclusion of code equivalency or non-code equivalency. Establishing the code equivalency between the standards will enable the laboratory to accept equipment from international partners or companies without fear of increased risk or noncompliance. The code equivalency process utilizes a group of qualified persons to create and review a White Paper. See Figure 1 for details of the process.

### 4.1. Writing a White Paper

FESHCom subcommittees establish a SME group of qualified persons to investigate whether a U.S. appropriate code or standard exists and can be used to establish code equivalency with the international code or standard that is used for design of specific type of equipment.

In cases, where multiple codes or standards are used to design same equipment, or multiple or ambiguous levels of code equivalency can be established, then the group of experts must come up with a clear scope and code equivalency pairs. For example, if a vessel is designed and stamped per EN13445, an equivalent U.S. code must be identified and listed, e.g. ASME BPVC Section VIII. If equipment is designed per one governing code, but supplied with protective devices per another governing code, a code equivalency should be established for that protective device separately.

A typical White paper includes:

(1) Abstract
(2) Placeholder for signatures of qualified people forming an investigating or advisory group
(3) List of work group members and consultants and their roles
(4) Goals
(5) Findings
(6) Recommendations
(7) References and supporting documents

Additionally, the White Paper may include:

- Independent technical verification by experts from outside Fermilab
- Examples from industry or other DOE labs showing safe use of equipment designed per international standards
- Research and investigations done by industry and other DOE labs proving code equivalency
- Design drawings, sketches, and calculations in support of findings

- Examinations and inspections of materials, in-process fabrications, non-destructive tests, and acceptance test in support of findings
- Documentation, traceability, and accountability for each unique system, including descriptions of design, testing, inspection, operation, repair, and maintenance in support of findings.

The White Paper must provide recommendations to CSO of code equivalency including any exceptions or exclusions between international and U.S. codes or standards can be established. The White Paper must be signed by all qualified persons who authored the white paper.

### 4.2. CSO Approval and FSO concurrence

If code equivalency can be established by the SME group, the findings of the White Paper will be discussed and reviewed by a wider audience of experts, typically the members of the appropriate FESHCom Subcommittee. In some cases two or more FESHCom Subcommittees may participate in the review if multiple areas of expertise are required. Typically, for a review by the FESHCom subcommittee, the group of subject matter experts must also propose a modification of the existing FESHM chapter to indicate code equivalency. The FESHCom Subcommittee Chair(s) are responsible for organizing feedback from their committees and delivering the feedback to the authors of the White Paper. Finally, if a White Paper passes review process by the FESHCom subcommittee(s), then it should be submitted to the CSO for approval and subsequent submittal to FSO for concurrence.

If code equivalency is too ambiguous or cannot be established, then the group of SME must report such findings to CSO. In such a scenario, each and every piece of equipment designed per international code must be reviewed per established criteria of FESHM to establish its safety and acceptance for operations with a possibility of exception granted by the Authority Having Jurisdiction.

### 4.3. Modification of existing FESHM chapter or creation of new FESHM chapter allowing code equivalency between international and U.S. codes and standards.

If code equivalency is established and recommendations of the White Paper are approved by FSO, an existing FESHM chapter can be amended/modified per established procedure to list international standards as appropriate standards for certain equipment. A typical example would be FESHM 5031 “Pressure Vessels” or 5031.1 “Process Piping”. Alternatively, a new FESHM chapter can be established to specifically list equipment (or part of equipment) designed per international code or standard. A typical example would be FESHM 5031.7 “Membrane cryostats”.

A chart on Figure 1 below describes the process flow for accepting international code or standard code equivalency and paths leading to accepting non-US coded equipment for use at Fermilab and at remote sites.

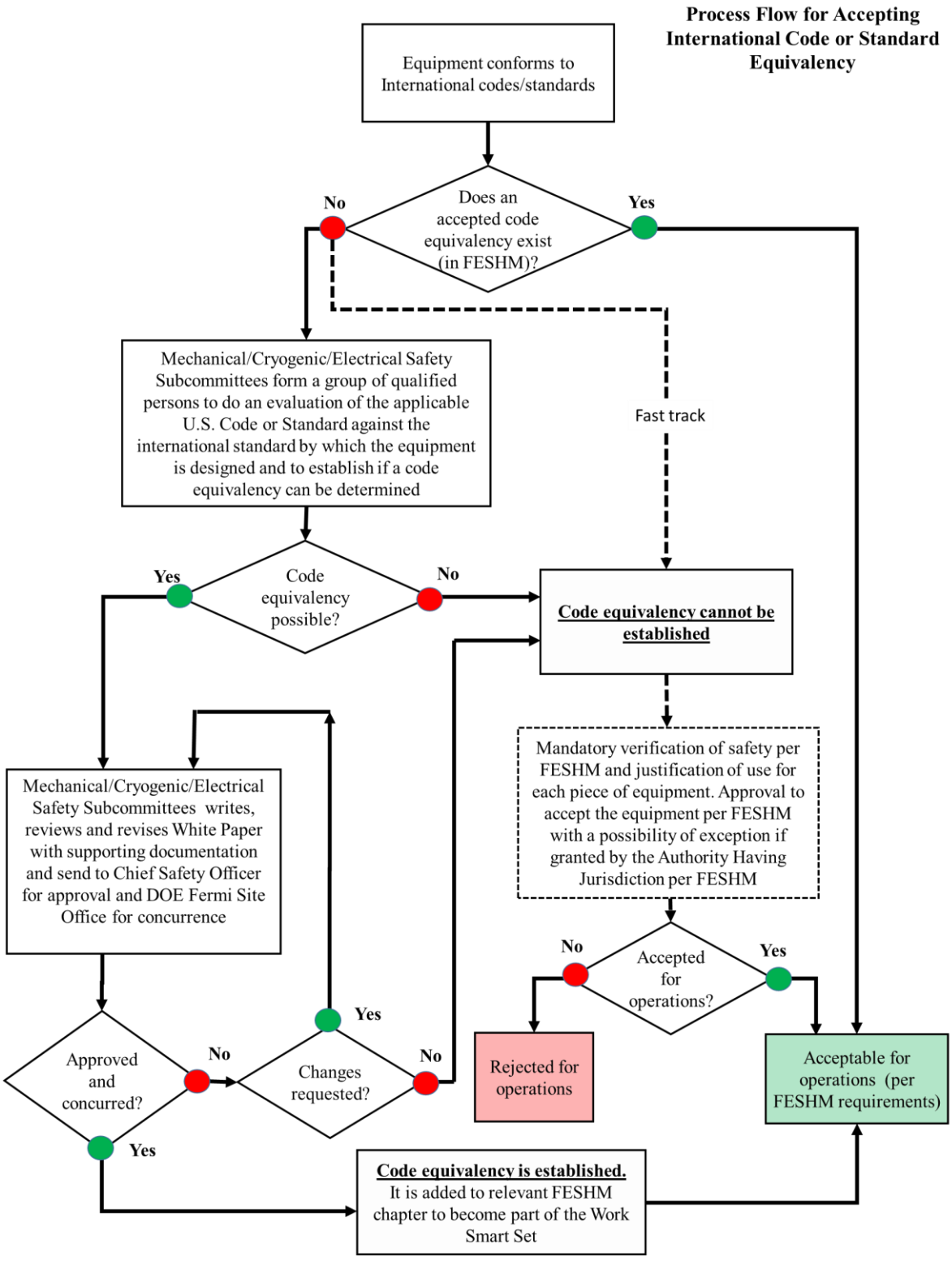


Figure 1 Process flow for accepting international code or standard code equivalency